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Paleoenvironment and deposition of the early Toarcian (Early Jurassic) siderite-bearing lacustrine sequence of the NE Ordos Basin, China: Implications for the Jenkyns Event

BINBING LI[1], XIN JIN[2], JACOPO DAL CORSO[3], JAMES G. OGG[1,3], XIANGUO LANG[1], VIKTÓRIA BARANYI[4], NEREO PRETO[5], PEIJUN QIAO[6] AND ZHIQIANG SHI[1]

[1]State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Chengdu University of Technology

[2]State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation and Key Laboratory of Deep-time Geography and Environment Reconstruction and Applications of Ministry of Natural Resources, Chengdu University of Technology

[3]State Key Laboratory of Biogeology and Environmental Geology, School of Earth Sciences, China University of Geosciences

[4]Department of Geology, Croatian Geological Survey

[5]Department of Geosciences, Università degli Studi di Padova

[6]State Key Laboratory of Marine Geology, Tongji University

Presenting Author: lbbgems@163.com

Organic carbon isotope analysis and palynology have shown that the deposition of lacustrine black shales and mudstones in the NE Ordos Basin recorded the terrestrial response to the early Toarcian hyperthermal episode, the Jenkyns Event. The early Toarcian lacustrine succession of the Anya section in the northeast Ordos Basin testifies for a climatically regulated lake extension during the Jenkyns Event. However, the processes involved in the accumulation and conservation of organic matter are still poorly understood. In the Anya section, petrographic investigation, element ratios (Sr/Cu and Rb/Sr) and weathering proxies (CIA, WIP and ICV) have been used together to infer that a warm-humid climate induced high chemical weathering at the regional level, but was interrupted by seasonal semihumid–semiarid climate excursions during the main phase of the Jenkyns Event. Two major anoxic episodes with high C_{org}/P ratios and abnormal positive $\delta^{34}S_{py}$ values are identified and coincide with a concurrently varying hydrogen index and TOC abundance. Paleosalinity proxies (Sr/Ba and S/TOC) suggest that the Anya section was generally deposited in freshwater. The Anya section includes organic-poor and organic-rich intervals, based on TOC. Pyrolysis (Rock-Eval) analysis of the Anya organic-rich rocks show that the kerogens are mainly Type II and Type II-III, implying a high plankton productivity and good potential for hydrocarbon production. In contrast, the Anya organic-poor rocks have low TOC and a low potential for hydrocarbon production with predominantly thermally mature Type III kerogen. This suggests that organic matter in the organic-poor intervals came mainly from higher land plants. The accumulation of organic-rich intervals is linked to global warming during the early phase of the Jenkyns Event, while the reduced organic matter preservation in organic-poor sediments may be driven by the variability of an intense monsoonal system during the main phase of the Jenkyns Event.